INSTRUCTION MANUAL
MODEL 121

Magnetic AB
Manufacturing Division

STOCKHOLM — BROMMA — SWEDEN

OPERATING NOTES

NOISE SOURCE MODEL 121

MAGNETIC AB
Stockholm, Sweden

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GAS TUBE REPLACEMENT

WARNING

The noise tube contains a slight amount of radio-active material. Thus, if the tube is broken it is important to clean the hands thoroughly after picking up the pieces. Actually the quantity of radio-active material in the tube is less than that on the luminous dial of a wrist watch, but if any radio-active material is taken into the body there could be injury.

WAVEGUIDE NOISE SOURCES MODEL 121

Model	3121	G121	J121	H121	X121	P121	K121	S121A
Frequency Range (kMc/s)	2.60-3.95	3.95-5.85	5.3-8.2	7.05-10.0	8.2-12.4	12.4 18.0	18.0-26.5	3.3-4.9
Excess noise (dB)	15.27 ± .2	15.20 ±.2	15.28 ±.2	15.62 ±.2	15.91 ±.2	15.91 ±.2	16.00 ±.2	15.20 ±.2
Discharge current (mA)	200	175	175	175	175	175	175	175
VSWR *)	ON: 1.2 maximum 1.08 average OFF: 1.2 maximum 1.08 average							
Waveguide Type	RG 48/U WR284 WG10	RG 49/U WR187 WG12	RG 50/U WR137 WG14	RG51/U WR112 WG15	RG 52/U WR90 WG16	RG 91/U WR62 WG18	RG 53/U WR42 WG20	WR229
Waveguide flange	UG 53/U	UG 149A/U	UG 344/U	UG 51/U	UG 39/U	UG 419/U	UG 595/U	CPR229
Approximate length	24" 600 mm	20" 500 mm	20" 500 mm	16 3/4" 425 mm	14 3/4" 375 mm	14 3/4" 375 mm	13 3/16" 335 mm	20" 500 mm
Argon gas tube	Signalite TD-38	Signalite TD-39	Signalite TD-39	Signalite TD-40 TD-72	Signalite TD-41	Signalite TD-41	Signalite TD-42	Signalite TD-39
Cable connector	BNC Type UG 932/U mates with BNC Type UG 931/U							

*) Noise source terminated in a well-matched load such as that provided by the 912 series.

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2. DESCRIPTION

The Magnetic Model 121 Noise Source consists of a gas-discharge tube mounted at an angle of approximately 10° in a section of waveguide. Care has been taken in the design of the noise source to achieve the high order of performance required in the accurate measurement of noise figure. The source presents a VSWR of less than 1.2 whether the tube is turned on or off. Spurious modes present because of the necessity of cutting into the guide for the tube are suppressed. The tube used is a cold-cathode type which is rated to have an excess noise power of about 15.5 dB. The gas tube gives a noise spectrum which is flat with frequency over the waveguide band.

Each end of the waveguide section is equipped with a cover-type flange. For optimum operation, the open end of the waveguide should be terminated with a low-reflection load, which has a VSWR of less than 1.02.

3. OPERATION

3.1 Operation with Noise Figure Meter Model 113

The Model 121 Noise Source is designed for use with the Model 113 (and 112) Noise Figure Meter, which supplies the required power.

1. Connect the 121 to the input of the device under test.
2. Terminate the other end of the waveguide section with a low-reflection load. If the source carries the designation TERMINATION on one end the load should be connected to this end.
3. Connect the Noise Source to the Noise Figure Meter GAS TUBE connector.
4. Read the discharge current on the noise figure meter instrument and adjust to the recommended value.

See: Noise Figure Meter Model 113, Operation.

3.2 DC Operation

The tubes used in the waveguide noise sources can be used for continuous (DC) operation, but they are designed primarily for pulse operation. Since the tube life will be shortened (500 hours) if the power dissipated in the cathode during DC operation exceeds that dissipated during pulse operation, it is recommended that for

continuous operation not more than half the recommended tube current for pulse operation be used. When a lower value of tube current is used, there will be a slight increase (less than 0.5 dB) in the excess noise available from the tube. The VSWR of the source may also be outside the specification. When the source is operated for long periods of time, DC-type tubes should be used.

Table 1 lists the different tube types available for the Model 121 Noise Source, these include tubes for pulse and CW operation and also high output tubes. (Neon-filled tubes with an excess noise of about 18 dB).

3.3 Sources of error

In some cases it is necessary to know the absolute value of noise figure. If so, consideration must be given to sources of error in the measurement.

The most important of the factors causing errors are:

1. Coupling and transmission line errors
2. Ambient or termination temperature different from 290°K
3. Receiver mismatch
4. Noise source mismatch

The first of these sources of error is a function of the coupling of the noise power source to the transmission line and the attenuation of the line. This can be estimated by measuring the hot and the cold transmission loss of the noise source. The decrease in excess noise can be computed from:

$$dP = 10 \log \left(1 - \frac{10 \log Ds}{10 \log Dt} \right) \times \left(1 - \frac{1}{Dt} \right) \text{ dB}$$

where,

Ds = cold transmission loss

Dt = hot transmission loss

(See also fig. 3.5 in the Model 113 Instruction Manual)

No correction is necessary with Noise Source Model 121 as the error is less than 0.05 dB.

The sources of error are treated in greater detail in the Model 113 Instruction Manual.

4. MAINTENANCE

The only replaceable part of Noise Source Model 121 is the discharge tube. The life is expected to be in the order of 2000 hours.

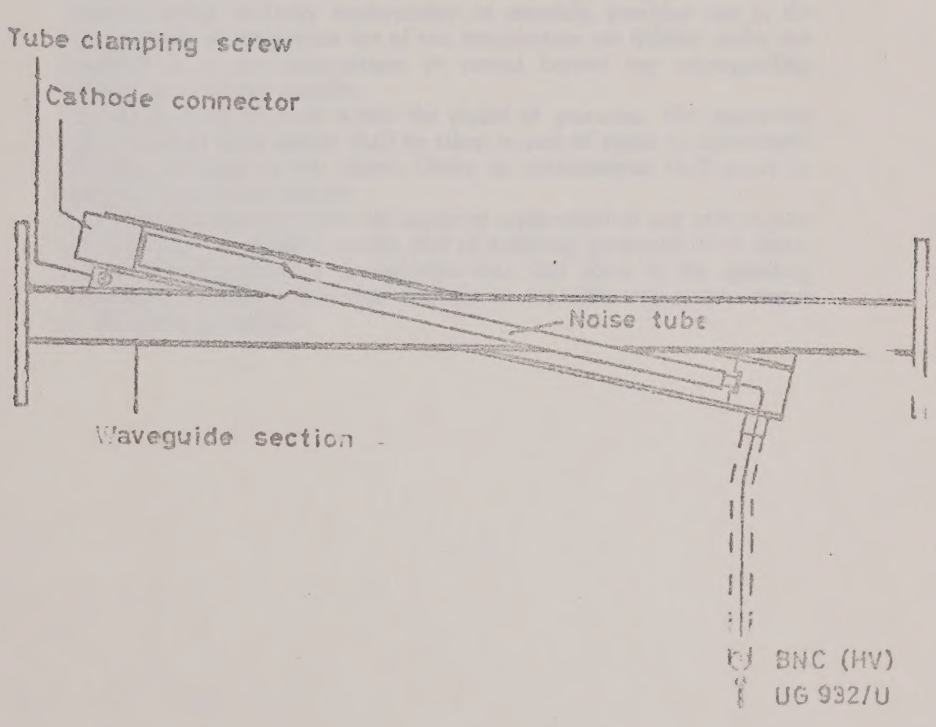
To remove the tube from the mount proceed as follows:

a. Loosen the tube clamping screw. (Cathode end)
b. Disengage the cathode connector from the tube.
c. Slip the tube out of its receptacle.
d. Insert a new tube in the receptacle, anode end first, and mate the tube and connector; tighten the tube clamping screw.

TABLE 1 Other Noise Tubes available for Noise Source Model 121

Bendix Tube number	Excess Noise * dB	Disch. Current mA	Tube Type	Gas	Freq. band
TD-12	15.20	250	DC	Argon	S
TD-34	17.76	250	DC	Neon	S
TD-56	17.90	200	Pulse	Neon	S
TD-10	15.32	250	DC	Argon	G
TD-48	17.68	250	DC	Neon	G
TD-43	17.81	200	Pulse	Neon	G
TD-10	15.40	250	DC	Argon	J
TD-48	17.75	250	DC	Neon	J
TD-43	17.86	200	Pulse	Neon	J
TD-11	15.55	200	DC	Argon	H
TD-23	17.95	200	DC	Neon	H
TD-44	17.91	175	Pulse	Neon	H
TD-18	15.83	200	DC	Argon	X, P
TD-54	18.00	200	DC	Neon	X, P
TD-55	17.85	175	Pulse	Neon	X, P

* As published by Bendix for tube-in-mount



Schematic diagram for Model 121 Noise Source
Principschema för bruskälla modell 121

Guarantee

We guarantee to repair or replace free of charge any of the goods, other than consumable material such as semiconductors valves, lamps and fuses, found to our satisfaction within 12 months after the date of delivery, to be defective owing to faulty workmanship or materials, provided that in the case of goods or component not of our manufacture our liability under this condition is in no circumstances to extend beyond any corresponding liability to us of our supplier.

Any claims must be made within the period of guarantee. We reserve the right to decide what actions shall be taken in case of repair or replacement of parts according to this clause. Under no circumstances shall goods be returned without our consent.

This guarantee does not cover the repair or replacement of any part or parts which fail due to mistakes on the part of operating personnel or of operation of the equipment in a way other than laid down in the operating instructions, or due to fair wear and tear or any other causes not covered by the above guarantee.

RETURN PROCEDURE:

Do not return goods without our written consent. A letter stating the claim should be sent to MAGNETIC AB, Manufacturing Division, Box 110 60 S-161 11, Bromma 11, Sweden. The failure must be clearly specified and model and serial number, of the equipment should be carefully noted.

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